

Marathon Petroleum Company LP			
Pressure Testing	Document No.: RSW-SAF-020-DT	Approval Date: 11/01/19	Page 1 of 7
	Revision No.: 11	Next Revision Date: 11/01/24	
	Document Custodian: Environmental, Safety and Security		

1.0 PURPOSE

- 1.1 To establish uniform practices for hydrostatic (pressure) testing of piping, equipment and tanks.
- 1.2 To provide information about applicable codes and specifications covering pressure testing.
- 1.3 To establish procedures to be followed to insure that all working conditions for employees are safe while pressure testing is in progress.
- 1.4 To prevent damage to equipment, piping and tanks while testing.

2.0 SCOPE

- 2.1 This procedure defines general requirements, limitations and responsibilities for pressure testing and the specifications and codes covering testing.
- 2.2 This procedure applies to all persons, including all visitors and contractors, working on Marathon Petroleum Company LLC, Michigan Refining Division property.

3.0 PROCEDURE

3.1 RESPONSIBILITY

- 3.1.1 All testing shall be the responsibility of the Construction Superintendent, Maintenance Foreman or Project Coordinator. All pressure tests shall be witnessed by a Marathon designated inspector. Piping test packages may be developed by different sources and submitted to the Inspection Department for approval of code compliance. Completed documentation shall be kept by the Inspection Department.
- 3.1.2 When a contractor has an approved quality control/quality assurance program that submits the documentation required by this procedure, Marathon Inspection Department personnel may audit or require hold points for hydrotests Marathon deems necessary.

3.2 GENERAL

- 3.2.1 All new piping and equipment packages must be reviewed and approved by the Inspection Department for appropriate scope, blinding requirements, and non-destructive testing techniques. The print of construction drawings, spool sheets, and sketches will be marked to document the scope, method, pressures, and signatures for testing records. This pressure test package must be issued prior to fabrication.
- 3.2.2 All new process piping and equipment shall be pressure tested before placing in service. Shop fabricated and shop tested equipment need not be re-tested in the field prior to being placed in service. Existing process piping and equipment shall be pressure tested after making modifications. Exceptions to this will require written requests stating why a pressure test is not possible and a proposed alternate procedure acceptable under the code. These will be subject to approval by the Engineering or Maintenance Manager and the Inspection Department Supervisor. When in question, the Inspection Department shall specify what existing piping and/or equipment shall be pressure tested after turnaround, cleaning and inspections.
- 3.2.3 Pressure tests shall be applied to all new vessel nozzle re-enforcing pads through tapped tell-tale holes. These holes are to be left open after testing. New steam jackets shall be tested. Test pressure of these items shall be approved by the Engineering Department and the Inspection Department.

3.2.4 The following Marathon Engineering Specifications apply and shall be used:

- SP-50-09 Process and Utility Field Piping Pressure Testing

- SP-75-04 Instrument Piping Field Pressure Testing
- SP-42-01 Pressure Vessels
- SP-42-18 Atmospheric Storage Tanks
- SP-44-01 Air Cooled Heat Exchangers
- Sp-44-02 Shell and Tube heat Exchangers
- SP-45-01 Fired heater Design

3.2.5 The following codes apply and shall be met:

- ASME Boiler Code, Section I
- ASME Unfired Pressure Vessel Code, Section VIII, Division I
- ASME Power Piping Code, ASME B-31.1
- ASME Steel Pipe Flanges, ASME B-16.5
- ASME Chemical Plant and Petroleum Refinery Piping, ASME B-31.3
- API RP-750 Process Safety Management
- API 570 Piping Inspection Code
- API 510 Pressure Vessel Inspection Code
- API 650 Welded Steel Tanks
- API 653 Tank Inspection and Repair
- National Board Inspection Code
- Any other applicable municipal, state, federal, or insurance, etc. codes

3.2.6 The above codes and specifications deal with the requirements of the test but may not cover the procedures to do the work safely. The following safety procedures shall be used when applying the above codes and specifications.

3.3 HYDROSTATIC TESTING

3.3.1 Pressure testing will normally be accomplished by water testing. Test pressures are determined by the limiting component and the Code of Construction. Permission must be obtained from the Maintenance or Engineering Manager and the Inspection Department Supervisor to use any liquids other than water as a testing medium. If oil or other liquids are used, the flash point must be above 120°F, and the upper limit for auto ignition must be considered.

3.3.2 If the use of water or low vapor pressure liquids is not possible, a service test may be substituted with additional NDE requirements determined by the Inspection Department Supervisor. These must be defined during the initial QC meeting and documented in the pressure test package.

3.3.3 Tightness testing for re-assembly of flanges and equipment may be done at up to 110% of relief valve set pressure or at 1.1 times design pressure. If tightness testing is done with the process fluid in order to keep water out of the system, then the test pressure shall not exceed 110% of the relief valve set pressure.

3.3.4 When possible, entire systems shall be tested as a system. However, shop tests are allowed if more economical.

3.3.5 Piping welds may be coated with epoxy-based paint prior to testing. Painted piping with 150# flange rating requires a hold time of 1-hour. Additional hold time is not required for flange ratings greater than 150#. Pieces that have been previously shop tested may be insulated when included in a system test.

3.3.6 The normal test pressure shall meet the requirements of the applicable code or standard. Cast

iron, plastic, and other specialty items shall not be tested above the design pressure unless permission is obtained from the Engineering Department.

- 3.3.7 Compressors, turbines, and instruments not capable of withstanding the test pressure shall not be field pressure tested and should be blinded or valved off from the tests.
- 3.3.8 If a pressure test includes a significantly modified vessel or exchanger, the attached form may be required and shall be reviewed by the Engineering Manager. New equipment having a documented shop hydrotest may require a tightness test before placing in service at the discretion of the Inspection Department Supervisor.
- 3.3.9 Blinding, Procedure - 8, is to be followed when testing in the refinery. When a test blind is removed, the flanges do not have to be retested. Always replace a blind with a new, clean gasket. At the discretion of the Inspection Department, valves may be used in lieu of blinds when testing if the valve seats are capable of withstanding the test pressure. A drain shall be opened down stream from a test valve to be sure that the valve is closed tightly. All valves shall be opened after the tests to insure that bonnets and other chambers are drained of water.
- 3.3.10 Relief or safety valves shall be removed or blinded up stream and are not to be gagged. Rupture disks shall be removed during the test.
- 3.3.11 Vents are to be used to insure a proper air purge of high points. Be sure that water comes out of the vents before closing to insure that the vent is not plugged. Flange pairs can be used as vents. All vents are to be opened prior to withdrawal of the testing medium to insure that a vacuum does not form. Testing medium shall be drained at a rate that does not exceed the in flow of air through the vent to ensure a vacuum is not created.
- 3.3.12 The testing medium temperature when testing piping must meet the requirements of ASME B31.3. The temperature of the test medium when testing vessels must meet the requirements of the NBIC. The testing medium when testing tanks and other equipment shall meet the requirements of the applicable code or standard. These temperatures are so the metal temperature will be above the brittle fracture transition temperature.
- 3.3.13 If the outside air temperature is below 35°F, precautions must be taken to protect against freezing, particularly for vents, drains, pressure gauges, instrument connections, and other small piping.
- 3.3.14 Pressure gauges shall meet the requirements of the applicable code or standard...
- 3.3.15 When conditions require that a pressure test be maintained for a period of time during which the testing medium in the system would be subject to thermal expansion, provision shall be made for relief of excess pressure.
- 3.3.16 When testing large gas ducts, etc. and items supported by counterweights, spring hangers, etc. additional support may be required to hold the weight of the testing medium. It may be possible to test the items at grade or in the shop and make a 100% radiograph of the installation welds. Contact the Engineering and Inspection Departments for assistance prior to testing these items.
- 3.3.17 Consider the support systems when testing large tanks, vessels and other like items and be sure the foundations are designed to take the extra weight of the testing medium.
- 3.3.18 When testing tall piping or equipment, the location of the pressure gauge must be considered to avoid errors due to static head.
- 3.3.19 When testing austenitic stainless steel, the chloride contamination of the testing medium shall be less than 50 ppm.
- 3.3.20 Remember that water flashes to steam when hot fluids come in contact with it. If using water creates a hazard, another testing media should be considered. After testing, if necessary,

be sure to dry all pipe and equipment before putting it into hot service; pigging may be necessary.

- 3.3.21 The pressure testing of expansion joints requires an Engineering review to determine requirements for restraints or isolation.
 - 3.3.22 Control valves shall be removed or blinded from piping during pressure testing and line flushing to protect the valves from dirt, scale and other foreign objects.
 - 3.3.23 Underground non-pressure sewer piping shall be tested full of water under maximum static head only for the system, and the joints inspected for leakage before backfilling.
 - 3.3.24 While the water is hooked up for testing, consider flushing dirt, scale and debris from piping system while water supply is connected.
 - 3.3.25 When testing low pressure storage tanks, the fill rate shall not exceed 3 feet per hour and the water temperature shall be maintained at 60°F or as allowed per API Standard 620. The filling of the tank is to be stopped if there is uneven settling or deformation while filling.
- 3.4 TESTING WITH AIR OR OTHER GASES, [SEE SP-50-09 SECTION 3.4 PNEUMATIC TESTING](#)

3.4 LEAK TESTING ("TIGHTNESS")

- 3.4.1 Leak testing piping or equipment after re-assembly with plant air or plant nitrogen at a pressure, not to exceed the design pressure, or up to 100 psig is allowed if the system has previously been hydrostatically tested at a higher pressure.
- 3.4.2 Reactors loaded with catalyst are to be "tightness" checked only with nitrogen. Using air may cause exothermic reactions from the heat of compression when pressurizing the reactor and so air should not be used.

3.5 SERVICE TESTING

- 3.5.1 Pressure testing of water, firewater, cooling water, instrument air and plant air lines may be done with the service fluid (less than 150 psig).
- 3.5.2 Service testing on liquid lines only need be done at highest operating pressure for the system.
- 3.5.3 Service testing on 2" and smaller instrument air, plant air, plant nitrogen, and low pressure steam is done by holding pressure at 25 psig while making the initial inspection. The piping may then be raised to operating pressure. Testing of new construction of 3" and larger instrument air and plant air piping shall follow the Testing With Air Or Other Gases section above.

4.0 DEFINITIONS

- 4.1 Hydrostatic Test- a test of the piping, equipment or system under pressure to give proof the welds and materials will withstand expected stresses and that the system is leak tight.
- 4.2 Tightness Test- a test under pressure for leaks after system re-assembly.
- 4.3 Service Test- a test with the normal fluid at the normal system pressure (less than 150 psig). Such tests will normally be used for water, firewater, cooling water, instrument air, plant air, plant nitrogen (<100 psi), and low pressure steam (150 psi or less) piping for initial test and retest.
- 4.4 Process Line- for purposes of this procedure means any line in the refinery containing hydrocarbons or toxic or flammable materials. For this procedure; water, firewater, cooling water, instrument air and plant air lines are not considered process lines. If any of these utilities are permanently connected to a process, then they are "process piping" up to the first block valve or the specification break.

5.0 REFERENCES

- 5.1 There are no references relevant to this procedure.

6.0 ATTACHMENTS

- 6.1 [Attachment A: Permit for Vessel Pressure Test](#)

REVISION HISTORY

Revision number	Description of change	Written by	Checked by	Effective date
7	Revised	J. Mather	Inspection	7/14/08
8	Updated Document Number	E. Dvorak	L. Mazur	12/30/09
9	Updated to follow current procedure. Deleted	D. Brown	L. Mazur	11/01/11
10	Scheduled review, removed ANSI references and added ASME	D. Brown	J. Rabideau	11/11/14
11	Complete scheduled review, minor changes per inspections	B. Iglewski	A. Morales	11/1/19

Attachment A:
SAFETY RULES AND PROCEDURES - 20
PERMIT FOR VESSEL PRESSURE TEST

UNIT _____
 DATE _____

VESSEL NAME _____

VESSEL NUMBER _____ HEIGHT _____

HORIZONTAL _____ VERTICAL _____ DIAMETER _____
 THICKNESS _____

VOLUME _____ CONDITION: NEW _____ USED _____

Has Inspection checked wall thickness? Yes _____ No _____

Inspector's Name _____

Field measured thickness? _____

Is test for City Inspection? Yes _____ No _____

Testing Medium: Water _____ Other _____

Design Pressure _____ PSIG Test Pressure _____ PSIG

Test Temperature to be _____ °F (Minimum 60°F)

Foundation and structure design has been checked for test load? Yes _____ No _____

PROCEDURE

Pipe or use high pressure hose from the top vent connection and from the fill point to a ground level test station. Install a pressure gage and relief valve set at _____ PSIG on the fill line. The test station is to be location _____ feet from the vessel (No less than three times the height or 100 feet whichever is greater).

After filling, install a gage on the vent line and pump up to the test pressure. The test pressure is to be held _____ minutes (No less than 30 minutes per inch of wall thickness, 30 minute minimum, and 2 hour maximum). No personnel are allowed in the area during this time. Next lower the pressure to the design pressure and inspect. After inspection, open vent and do not drain faster than the air can come in through the vent connection so that a vacuum is not formed.

PERSON RESPONSIBLE FOR TEST _____

APPROVAL TO TEST _____

Maintenance or Engineering Engineer